CLAIMS

1.   A method of classifying a piece of material, comprising acts of:

    (A)   detecting x-rays fluoresced from the piece;

    (B)   detecting optical emissions emitted from the piece; and

    (C)   classifying the piece based on at least one of: the detected x-rays, and the detected optical emissions.

2.   The method of claim 1, further comprising an act of:

    (D)   irradiating the piece with x-ray photons to cause the piece to fluoresce the fluoresced x-rays.

3.   The method of claim 2, further comprising an act of:

    (E)   vaporizing a portion of the piece to produce a plasma that emits the optical emissions.

4.   The method of claim 3, further comprising an act of:

    (F)   conveying the piece into an area in which acts (A), (B), (D) and (E) are performed.

5.   The method of claim 4, further comprising an act of:

    (G)   conveying the piece out of the area in which acts (A), (B) (D) and (E) are performed.

6.   The method of claim 5, further comprising an act of:

    (H)   sorting the piece based on the classification.

7.   The method of claim 1, further comprising an act of:

    (D)   vaporizing a portion of the piece to produce a plasma that emits the optical emissions.

8.   The method of claim 7, wherein act (D) includes vaporizing the portion of the piece using a laser beam.

9.   The method of claim 7, wherein act (D) includes vaporizing the portion of the piece using an electrical discharge.

10.   The method of claim 1, wherein the act (C) includes classifying the piece based on the detected x-rays.

11.   The method of claim 1, wherein the act (C) includes classifying the piece based on the detected optical emissions.

12.   The method of claim 1, wherein the act (C) includes classifying the piece based on the detected x-rays and the detected optical emissions.

13.   The method of claim 1, wherein a predetermined number of potential classifications are available, and wherein the act (C) includes acts of:

(1)   analyzing only the detected optical emissions to reduce the predetermined number to a reduced number of potential classifications; and;

(2)   classifying the piece of material as one of the reduced number of classifications based on the detected x-rays.

14.   The method of claim 13, wherein act (C)(1) includes determining that a threshold percentage of the collected optical emissions were emitted by one or more particular elements included within the piece.

15.   The method of claim 14, wherein at least one of the one or more particular elements is a low-Z element.

16.   The method of claim 15, wherein at least one of the one or more particular elements is aluminum.

17.   The method of claim 13, wherein the reduced number of classifications represent a number of alloys belonging to a same alloy group.

18. The method of claim 17, wherein the alloy group is an aluminum alloy group.

19. The method of claim 1, wherein a predetermined number of potential classifications are available, and wherein the act (C) includes acts of:

(1) analyzing only the detected x-rays to reduce the predetermined number to a reduced number of potential classifications; and

(2) classifying the piece of material as one of the reduced number of classifications based on the detected optical emissions.

20. The method of claim 1, wherein act (C) includes:

(1) creating one or more emissions spectra from the detected x-rays and detected optical emissions; and

(2) estimating peak values for one or more regions of interest of the one or more spectra.

21. The method of claim 20, wherein act (C)(2) includes applying a shape fitting function to data corresponding to the one or more regions of interest.

22. A system for classifying a piece of material, comprising:

a classification module to receive x-ray fluorescence information representing x-rays fluoresced from the piece, to receive optical emissions information representing optical emissions emitted from the piece, and to classify the piece based on at least one of the x-ray fluorescence information and the optical emissions information.

23. The system of claim 22, further comprising:

an x-ray detector to detect the x-rays fluoresced from the piece;

an optical emissions collector to detect the optical emissions emitted from the piece.

24. A system for classifying a piece of material, comprising:

one or more inputs to receive x-ray fluorescence information representing x-rays fluoresced from the piece and optical emissions information representing optical emissions emitted from the piece; and

  means for classifying the piece based on at least one of the x-ray fluorescence
5 information and the optical emissions information.

25. A computer-readable medium having computer-readable signals stored thereon that define instructions that, as a result of being executed by a computer, control the computer to perform a method of classifying a piece of material, the method comprising
10 acts of:

  (A) detecting x-rays fluoresced from the piece;

  (B) detecting optical emissions emitted from the piece; and

  (C) classifying the piece based on at least one of: the detected x-rays, and the detected optical emissions.

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